WHAT IS CLAIMED IS:

SUB B2

1. In a synchronous machine, a rotor comprising:

a rotor core;

a super-conducting coil winding extending around at least a portion of the rotor core, said coil winding having a coil end section adjacent an end of said rotor core, and

a coil support bracing said end section and being thermally isolated from said rotor core.

2. In a rotor as in claim 1 wherein said coil support is a split clamp.

3. In a rotor as in claim 1 wherein the coil support includes a pair of plates between which are sandwiched the coil end section.

4. In a rotor as in claim 1 further comprising a cryogenic coupling providing cooling fluid to said coil winding, wherein said coil support is cooled by conduction from said coil winding.

5. In a rotor as in claim 1 further comprising a rotor end shaft having a slot to receive said coil end section and coil support, and said end shaft is thermally isolated from said coil support.

6. In a rotor as in claim 1 wherein said coil support braces an entire length of said coil end section.

B2 Cont

7. In a rotor as in claim 1 wherein said coil support is transverse to an axis of the rotor core.

8. In a rotor as in claim 1 further comprising a second coil end section adjacent a second end of said rotor core, and a second coil support bracing the second coil end section.

9. In a rotor as in claim 1 wherein said coil support further comprises side supports attached to a long side section of said coil.

10. In a rotor as in claim 1 wherein said coil supports further comprises at least one tension rod extending transversely through said rotor core, and coil housings attached to opposite ends of the tension rod, wherein said coil housings each attached to an opposite long side section of the coil.

11. In a rotor as in claim 10 wherein said tension rod extends through a conduit in the rotor core.

SUB B3

12. A method for supporting a super-conducting coil winding on a rotor core of a synchronous machine comprising the steps of:

a. bracing an end section of the coil winding with an end coil support;
b. assembling the coil winding, end coil support and rotor core;
c. attaching a rotor end shaft to said rotor core;
d. thermally isolating the coil support from the rotor core and shaft.

13. A method as in claim 12 wherein the end section is braced with a split clamp.

14. A method as in claim 12 wherein the assembling step includes inserting the end section of the coil and the coil support into a slot of the rotor end shaft.

SUB B4

15. A method as in claim 12 wherein the bracing step includes applying plates on opposite surfaces of the end section.

16. A method as in claim 12 further comprising cryogenically cooling the coil, and cooling said end coil support by heat transfer between the coil and the coil support.

SUB B5

17. A rotor for a synchronous machine comprising:

a rotor core having at least one rotor core end orthogonal to a longitudinal axis of the rotor;

at least one end shaft attached to said rotor core end;

a race-track super-conducting (SC) coil winding extending around said rotor core and having a coil end section adjacent said rotor end;

a coil support brace attached to said coil end section and thermally isolated from said rotor core and rotor end shaft.

18. In a rotor as in claim 17 wherein said coil support brace is a split clamp.

19. In a rotor as in claim 17 wherein the coil support brace includes a pair of plates between which are sandwiched the coil end section.

20. In a rotor as in claim 17 further comprising a cryogenic coupling providing cooling fluid to said coil winding, wherein said coil support is cooled by conduction from said coil winding.

21. In a rotor as in claim 1 wherein said rotor end shaft has a slot to receive said coil end section and coil support, and said end shaft is thermally isolated from said coil support.

22. In a rotor as in claim 17 wherein said coil support brace covers an entire length of said coil end section.

23. In a rotor as in claim 17 wherein said coil support brace is transverse to an axis of the rotor core.

24. In a rotor as in claim 17 further comprising a second coil end section adjacent a second end of said rotor core, and a second coil support brace attached to the second coil end section.

25. In a rotor as in claim 17 further comprising coil side supports attached to a long side section of said coil.

26. In a rotor as in claim 17 further comprising at least one tension rod extending transversely through said rotor core, and coil housingsattached to opposite ends of the tension rod, wherein said coil housings each attached to an opposite long side section of the coil.

27. In a rotor as in claim 17 wherein said tension rod extends through a conduit in the rotor core.